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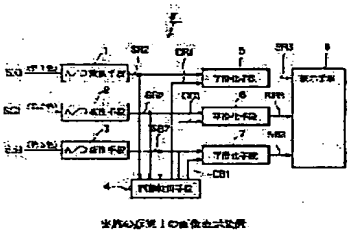
## (54) IMAGE DISPLAY DEVICE AND IMAGE DISPLAY METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image display device that makes lines not to be seen thinner even though dark characters and lines are displayed in a bright background.

SOLUTION: It is provided with smoothing means 5-7 that perform smoothing processing selectively to image data to be inputted, an image detection means 4 that discriminates a dark part and a bright part of an image from the image data to be inputted and at the same time, generates a control signal that selects the smoothing processing to be performed to image data of the bright part neighbouring to the dark part and sends it to the smoothing means 5-7, and a display means 8 that displays an image based on the image data outputted from the smoothing means 5-7.



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CLAIMS

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[Claim(s)]
[Claim 1] The image display device characterized by to have an image detection means generates the control signal which chooses data smoothing performed to the image data of the bright section which adjoins dark space, and send out to said smoothing means, and a display means display an image based on the image data outputted from said smoothing means while distinguishing the dark space and the bright section of an image from the image data which inputs as a smoothing means perform data smoothing selectively to the image data to input.
[Claim 2] When the data for every color in three primary colors are obtained from said image data to input, said smoothing means It is prepared so that data smoothing can be individually performed selectively with said control signal to the data for said every color in three primary colors. Said image detection means The image display device according to claim 1 characterized by sending out to a smoothing means to generate a control signal and to correspond according to an individual to the data for said every color in three primary colors.
[Claim 3] It is the image display device according to claim 2 with which said image detection means generates a control signal, and is characterized by sending out to a smoothing means to correspond for said every color in three primary colors based on said luminance signal when a luminance signal is acquired from said image data to input with the data for every color in three primary colors.
[Claim 4] Said image detection means is the image display device of three claim 1 characterized by being able to detect the profile section of said image, generating the control signal which chooses data smoothing performed to the image data of this bright section when the image which adjoins the profile of an image is a bright section, and sending out to said smoothing means while distinguishing the dark space and the bright section of an image from input image data thru/or given in any 1 term.
[Claim 5] Said image detection means is the image display device of three claim 1 characterized by being able to detect that the dark space of said image is below predetermined width of face, generating the control signal which chooses data smoothing performed to the image data of the bright section of the image which adjoins the dark space of this image when the dark space of an image is below predetermined width of face, and sending out to said smoothing means while distinguishing the dark space and the bright section of an image from input image data thru/or given in any 1 term.
[Claim 6] Said smoothing means is the image display device of five claim 2 characterized by changing the property of a filter of performing data smoothing for said every color in three primary colors thru/or given in any 1 term.
[Claim 7] It is the image display device according to claim 1 characterized by generating said control signal [ as opposed to / said smoothing means is established so that data smoothing can be selectively performed to said luminance signal with said control signal, and / said luminance signal in said image detection means ] when a luminance signal is acquired from said image data to input with the data for every color in three primary colors, and sending out.
[Claim 8] When the image data which serves as a step which detects the dark space of an image, and dark space of an image from the image data to input is detected, this image data is received. The step to which data smoothing is not made to perform, and the step which detects the bright section of an

image from the image data to input, The image display approach characterized by having the step which chooses the filter to graduate, and the step which repeats each above-mentioned step until image data is completed to this image data when the image data used as the bright section of an image is detected.
[Claim 9] The image display approach according to claim 8 further characterized by choosing the filter graduated to this image data at a step when the image data used as the bright section of said image is detected only when this image data adjoins the profile section.
[Claim 10] The image display approach according to claim 8 further characterized by choosing the filter graduated to this image data at a step when the image data used as the bright section of said image is detected only when this image data adjoins the dark space of predetermined width of face.
[Claim 11] Claim 8 characterized by choosing the filter with which properties differ for every color in three primary colors at a step when the image data used as the bright section of said image is detected thru/or the image display approach of ten given in any 1 term.
[Claim 12] Claim 8 characterized by choosing the filter which graduates a luminance signal at a step when the image data used as the bright section of said image is detected thru/or the image display approach of ten given in any 1 term.

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[Translation done.]



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image display device and the image display approach of carrying out profile amendment processing for making legible a profile, a thin line, etc. in an image of the image data inputted especially about the image display device and the image display approach of carrying out an image processing in digital one and displaying to the image data to input.
[0002]
[Description of the Prior Art] The liquid-crystal:liquid crystal display (LCD) from the former, a plasma-display-panel:plasma display panel (PDP), a light emitting diode: Image display components, such as a light emitting diode (LED) and an electro-luminescence (EL) panel, are known. Moreover, red (red: R) and the image display device using green (Green: G) and the display device of a matrix mold constituted by putting a majority of the set in order, using a blue (blue: B) cel in three primary colors as one set are known in those image display components (cel).
[0003] Drawing 28 is the block diagram showing the configuration of the conventional image display device. The image display device 101 of drawing 28 the image data SR1, SG1, and SB1 of the analog signal inputted for every color of R (red: the 1st color), G (green : the 2nd color), and B(blue: 3rd color) ** in three primary colors by sampling on a predetermined frequency Analog-to-digital (A/D) conversion means 1-3 to change into the image data (SR2, SG2, SB2) of a digital signal, It is constituted by

smoothing means 5-7 to perform data smoothing with the filter later mentioned to image data (SR2, SG2, SB2), and to output image data SR3, SG3, and SB3, and display means 8 to display an image based on image data SR3, SG3, and SB3.

[0004] Here, the smoothing means 5-7 are inserted by the reason for explaining below. The case where the line and alphabetic character of a dark part (for example, black) are used for the background of a bright part (for example, white ground) in a display image from the reason for suggesting the line and alphabetic character on actual paper in the document preparation using a personal computer (PC) in recent years etc. has increased.

[0005] Since a actual twist also expands and looks generally as for the part of the bright color in a display image For example, even if it is the 1-pixel same point, by the case where a white point (or line) is displayed into a black background, and the case where a black point (or line) is displayed into a white background, as for the direction of a white point, it is recognized greatly (expanding) by the user and the direction of the point that it is black conversely is recognized small (contracting) by the user.

[0006] Drawing 29 (a) is drawing showing the luminance distribution for every cel at the time of displaying the image of a white line into a black background in a display means, and drawing 29 (b) is drawing showing the luminance distribution for every cel at the time of displaying the image of a black line into a white background in a display means.

[0007] Since this conventional image display device 101 uses the display device of a matrix mold, the axis of abscissa of drawing 29 (a) and (b) shows the horizontal position on the screen of the display means 8. Moreover, as for G0a to the cel of red in three primary colors, and G9a, R0a to R9a shows the cel of blue in three primary colors, one cel each of red (R), green (G), and blue (B) arranges B0a to a green cel in three primary colors and B9a in order from the left, together with all of three pieces, it is one set (ST) and the 1ST is equivalent to 1 pixel each of a display means. Moreover, an axis of ordinate is brightness.

[0008] Since the case where a 1-pixel white point (or line) is displayed into a black background is shown in the case of drawing 29 (a), the white point (or line) expands to a user, and is recognized. On the other hand, since drawing 29 (b) shows the case where a 1-pixel black point (or line) is displayed into a white background, the black point (or line) is contracted and recognized by the user.

[0009] When the image of drawing 29 (a) and drawing 29 (b) is displayed with the conventional image display device, also as for a actual twist, in drawing 29 (a), an alphabetic character and a line come to seem to have mentioned above thickly, and, also as for a actual twist, an alphabetic character and a line come to look thinly in drawing 29 (b). Therefore, at the time of the display of drawing 29 (a), usual [ of a certain thing ] can recognize inconvenience, such as being hard coming to see a fine alphabetic character etc. from a thin line being visible to a thick wire. However, at the time of the display of drawing 29 (b), since a thin line looks still thinner, it is hard coming to see an alphabetic character, a line, etc., and they may be unable to recognize.

[0010] Moreover, recent years come, and to the display of PC, since working efficiency, such as document preparation, wants to rise, the resolution of a display is rising from hope that you want to increase the content of a display over the 1 display screen. If the resolution of a display rises, the magnitude of 1 pixel to a screen size will become small relatively. Then, when the linea nigra and a black alphabetic character are displayed into a white background like [ at the time of the display of drawing 29 (b) ], an alphabetic character and a line come to look still thinner to a user.

[0011] Then, it was possible by performing profile amendment of an alphabetic character or a line using a smoothing filter to smooth the white of the profile parts of the alphabetic character displayed or a line, and a black level difference, and to make it the linea nigra or black alphabetic character in a white background not look thin too much.

[0012] Drawing 30 is drawing showing the property of the smoothing filter used for the conventional profile amendment. Like drawing 29 , the axis of abscissa of drawing 30 shows the horizontal position on the screen of the display means 8, one cel each of red (R), green (G), and blue (B) arranges it in order

from the left, together with all of three pieces, it is one set (ST), and the 1ST is equivalent to 1 pixel each of a display means, and n expresses the positive integer of arbitration. Moreover, an axis of ordinate is brightness.

[0013] The filter shape in a smoothing means 7 for the filter property in a smoothing means 5 to graduate red (the 1st color) image data SR2 to be FR1, and for the filter property in a smoothing means 6 to graduate the image data [ being green (the 2nd color) ] SG2 to be FG1, and to graduate blue (the 3rd color) image data SB2 is FB1.

[0014] For example, the pixel of STn+1 is a flake (bright section), and when STn and the pixel of STn+2 are sunspots (dark space), the brightness of each image data in STn+1 (bright section) is graduated with a filter property, and decreases, and STn and the brightness of each image data of STn+2 (dark space) are graduated by the filter shape, and increase.

[0015] Drawing 31 (a) and (b) are the luminance distribution of the image which carried out data smoothing of the image shown in drawing 29 using the smoothing filter of drawing 30 . Moreover, in G9b in three primary colors from a cel and G0b and G1c to red G8c, B9b in three primary colors from a green cel and B0b and B1c to B8c shows [ R9b from R0b, and R1c to R8c ] the cel of blue in three primary colors, and other setting out is the same as that of drawing 29 .

[0016] Drawing 31 (a) is as a result of [ at the time of carrying out data smoothing of the image data which displays a flake into the black background of drawing 29 (a) ] processing. the brightness of the flake (R2b, G2b, B-2b) of ST2 -- each (R2c and G2c --) at the same time it decreases by B-2c -- the black background (sunspot) brightness of ST1 (R1b, G1b, B1b) and ST3 (R3b, G3b, B3b) of the both-sides section of the ST2 -- each (R1c, G1c, B1c) -- and (R3c, G3c, B3c) -- a part -- only -- it is increasing.

[0017] Moreover, drawing 31 (b) is as a result of [ at the time of carrying out data smoothing of the image data which displays the black point in the white background of drawing 29 (b) ] processing. at the same time the brightness of the sunspot (R7b, G7b, B7b) of ST7 increases by each (R7c1+R7c2, G7c1+G7c2, B7c1+B7c2) the brightness of the white background of ST6 (R6b, G6b, B6b) and ST8 (R8b, G8b, B8b) of the both-sides section of the ST7 -- each (R6c, G6c, B6c) -- and (R8c, G8c, B8c) -- a part -- only -- it is decreasing. Especially the increment of the brightness of the sunspot of ST7 has doubled by adding data smoothing of ST6 and ST8 of the both-sides section of the ST7.

[0018] Although the situation where the linea nigra in a white background and the display of a black alphabetic character disappear can improve by it since the brightness of a black point was going up by the image display approach by the conventional profile amendment while the white point and the black point were graduated similarly as mentioned above, namely, the brightness of a white point fell Instead, it has deteriorated also about not only the linea nigra and black alphabetic character in a white background but the white line in a black background, or the sharpness of a white alphabetic character. Especially extent in which sharpness deteriorates in the linea nigra and black alphabetic character in a white background since the increment in the brightness by data smoothing doubles becomes large.

[0019]

[Problem(s) to be Solved by the Invention] In the image display device which does not carry out profile amendment as mentioned above, like the linea nigra in a white background, or a black alphabetic character, the conventional image display device has the problem that a line looks thin, when a dark alphabetic character and a dark line are displayed into a bright background.

[0020] Moreover, in order to solve the above-mentioned problem, when a smoothing means (filter) is used and profile amendment is carried out, there is a problem that the parts of the white line in a black background without the need for profile amendment, the bright alphabetic character in a dark background like a white alphabetic character, or a line will also be graduated.

[0021] Moreover, since the brightness of the parts of the dark alphabetic character in a bright background or a line increases and the brightness of the parts of the bright alphabetic character in a dark background or a line decreases when profile amendment is carried out using a smoothing means,

sharpness deteriorates as a result. Especially the sharpness of the parts of the dark alphabetic character in a bright background or a line has a problem of degradation greatly.
[0022] It is made in order that this invention may solve the problem of the **** former mentioned above, even if it displays a dark alphabetic character and a dark line into a bright background, a line does not look thin and the parts of the bright alphabetic character in a dark background or a line are not graduated, but it aims at offering further the image display device with which the sharpness of an alphabetic character or a line does not deteriorate.
[0023]
[Means for Solving the Problem] In order to attain the above-mentioned object, the image display device of this invention indicated to claim 1 While distinguishing the dark space and the bright section of an image from the image data inputted as a smoothing means to perform data smoothing selectively to the image data to input It is characterized by having an image detection means to generate the control signal which chooses data smoothing performed to the image data of the bright section which adjoins dark space, and to send out to said smoothing means, and a display means to display an image based on the image data outputted from said smoothing means.
[0024] When the data for every color in three primary colors are obtained from said image data to input, in an image display device according to claim 1, this invention of claim 2 said smoothing means the data for said every color in three primary colors -- receiving -- an individual exception -- and it is prepared so that data smoothing can be selectively performed with said control signal, and said image detection means is characterized by sending out to a smoothing means to generate a control signal and to correspond according to an individual to the data for said every color in three primary colors.
[0025] When, as for this invention of claim 3, a luminance signal is acquired from said image data to input with the data for every color in three primary colors in an image display device according to claim 2, said image detection means is characterized by generating a control signal and sending it out to a smoothing means to correspond, for said every color in three primary colors, based on said luminance signal.
[0026] This invention of claim 4 is characterized by being able to detect the profile section of said image, generating the control signal which chooses data smoothing performed to the image data of this bright section when the image which adjoins the profile of an image is a bright section, and sending out to said smoothing means while said image detection means distinguishes the dark space and the bright section of an image from input image data in the image display device of three claim 1 thru/or given in any 1 term.
[0027] This invention of claim 5 is set to the image display device of three claim 1 thru/or given in any 1 term. Said image detection means While distinguishing the dark space and the bright section of an image from input image data, it is detectable that the dark space of said image is below predetermined width of face. When the dark space of an image is below predetermined width of face, it is characterized by generating the control signal which chooses data smoothing performed to the image data of the bright section of the image which adjoins the dark space of this image, and sending out to said smoothing means.
[0028] This invention of claim 6 is characterized by said smoothing means changing the property of a filter of performing data smoothing for said every color in three primary colors in the image display device of five claim 2 thru/or given in any 1 term.
[0029] When, as for this invention of claim 7, a luminance signal is acquired from said image data to input with the data for every color in three primary colors in an image display device according to claim 1, said smoothing means is established so that data smoothing can be selectively performed to said luminance signal with said control signal, and said image detection means is characterized by generating and sending out said control signal over said luminance signal.
[0030] The image display approach of this invention indicated to claim 8 When the image data which serves as a step which detects the dark space of an image, and dark space of an image from the image

data to input is detected, this image data is received. The step to which data smoothing is not made to perform, and the step which detects the bright section of an image from the image data to input, When the image data used as the bright section of an image is detected, it is characterized by having the step which chooses the filter to graduate, and the step which repeats each above-mentioned step until image data is completed to this image data.

[0031] In the image display approach according to claim 8, at a step when the image data used as the bright section of said image is detected, further, this invention of claim 9 is characterized by choosing the filter to graduate to this image data, only when this image data adjoins the profile section.

[0032] In the image display approach according to claim 8, at a step when the image data used as the bright section of said image is detected, further, this invention of claim 10 is characterized by choosing the filter to graduate to this image data, only when this image data adjoins the dark space of predetermined width of face.

[0033] This invention of claim 11 is characterized by choosing the filter with which properties differ for every color in three primary colors in the image display approach of ten claim 8 thru/or given in any 1 term at a step when the image data used as the bright section of said image is detected.

[0034] This invention of claim 12 is characterized by choosing the filter which graduates a luminance signal in the image display approach of ten claim 8 thru/or given in any 1 term at a step when the image data used as the bright section of said image is detected.

[0035]

[Embodiment of the Invention] Hereafter, it explains based on the operation gestalt illustrating this invention.

Gestalt 1. drawing 1 of operation is the block diagram showing the configuration of the image display device of the operation gestalt 1 of this invention, and drawing 2 – drawing 4 are the block diagrams showing other examples of a configuration of the image display device of drawing 1 R> 1. In addition, in drawing 1 – drawing 4 , about the part of the same function as the conventional image display device 101 shown in drawing 28 , the same sign is attached and the overlapping explanation is omitted.

[0036] The point that the image display device 81 of the operation gestalt 1 shown in drawing 1 mainly differs from the conventional image display device 101 shown in drawing 28 The point that an image detection means 4 to output the control signals CR1, CG1, and CB1 for choosing the filter in the smoothing means 5-7 to smoothing means 5-7 to correspond respectively is added while each outputs SR2, SG2, and SB2 of the A/D-conversion means 1-3 are inputted, and in the smoothing means 5-7 It is the point of having two or more filters of a different property including what does not carry out data smoothing, and having selection means, such as a switch which changes the filter. Moreover, about the internal configuration of the image detection means 4 and the smoothing means 5-7, it mentions later using drawing 5 and drawing 6 .

[0037] The image display device 82 of drawing 2 shows a configuration in case input image data is a luminance signal and a chrominance signal, and that whose input image data was the three primary colors (SR1, SG1, SB1) has become a luminance signal SY1 and two signals of a chrominance signal SC 1 in the image display device 81 of drawing 1 . Therefore, it has become two of an A/D-conversion means 10 by which an A/D-conversion means 9 by which the luminance signal SY1 of an analog signal is inputted, and the luminance signal SY2 of a digital signal is outputted also about an A/D-conversion means, and the chrominance signal SC 1 of an analog signal are inputted, and the chrominance signal SC 2 of a digital signal is outputted. Moreover, a matrix means 11 for a luminance signal SY2 and a chrominance signal SC 2 to be inputted, and to output a digital RGB output (SR2, SG2, SB2) is added. However, it is the same as that of the image display device 81 shown in drawing 1 also with the image display device 82 of drawing 2 about the internal configuration of the image detection means 4 and the smoothing means 5-7.

[0038] The image display device 83 of drawing 3 shows a configuration in case input image data is composite signal SP1 of a luminance signal and a chrominance signal, and that whose input image data

was the three primary colors (SR1, SG1, SB1) serves as composite signal SP1 of a luminance signal and a chrominance signal in the image display device 81 of drawing 1 . Therefore, it has become only one of an A/D-conversion means 12 by which composite signal SP1 of an analog signal is inputted, and composite signal SP2 of a digital signal is outputted also about an A/D-conversion means. Moreover, a Y/C separation means 13 to separate a luminance signal SY2 and a chrominance signal SC 2 from composite signal SP2, and a matrix means 11 for a luminance signal SY2 and a chrominance signal SC 2 to be inputted, and to output a digital RGB output (SR2, SG2, SB2) are added. However, it is the same as that of the image display device 81 shown in drawing 1 also with the image display device 83 of drawing 3 about the internal configuration of the image detection means 4 and the smoothing means 5-7.

[0039] moreover, in the above-mentioned image display devices 81-83 of drawing 1 - drawing 3 each format (the three primary colors --) of inputting with an analog signal in order to amend the profile of the image displayed on the display means 8 Sample the image data of a luminance signal/chrominance signal, and a composite signal on a predetermined frequency, and it is changed into the three-primary-colors image data of a digital signal. Although how to output the control signals CR1, CG1, and CB1 for choosing the filter in the smoothing means 5-7 using the three-primary-colors image data of the digital signal to smoothing means 5-7 to correspond respectively was explained With this operation gestalt, an input does not restrict to an analog signal, and also when digital image data is inputted [ for example, ] into the display means 8, it can apply.

[0040] Drawing 4 is a block diagram in which the input in the gestalt 1 of operation shows the configuration of the image display device of digital data. In the image display device 83 of drawing 4 , 15 is the input terminal of digital image data SR2 of the red who is the 1st color which constitutes the three primary colors, 16 is the input terminal of the green digital image data SG2 which is the 2nd color which constitutes the three primary colors, and 17 is the input terminal of digital image data SB2 of the blue which is the 3rd color which constitutes the three primary colors. Moreover, with the image display device 83, that whose input image data was the three primary colors (SR1, SG1, SB1) of an analog serves as the three primary colors (SR1, SG1, SB1) of digital ** with the image display device 81 of drawing 1 . Therefore, although the need becomes that there is nothing about an A/D-conversion means since it becomes a digital signal from the first, about the configuration which carries out processing after each digital image data SB [ SR2 SG2, and ] 2, it becomes being the same as that of the image display device 81 of drawing 1 . Therefore, it is the same as that of the image display device 81 shown in drawing 1 also with the image display device 84 of drawing 4 about the internal configuration of the image detection means 4 and the smoothing means 5-7.

[0041] Drawing 5 is drawing showing the internal configuration of the image detection means 4 of drawing 1 - drawing 4 . The image detection means 4 is constituted by three comparison means 21, 23, and 25 corresponding to each of the image data of a digital signal in three primary colors which consist of comparators etc., and the threshold storage means 22, 24, and 26 which consist of memory etc. and a control signal generation means 27 which consists of a microprocessor etc., for example to generate control signals CR1, CG1, and CB1 from the comparison result of each comparison means 21, 23, and 25.

[0042] In addition, although explanation of above-mentioned drawing 5 explained the configuration in case the image data inputted into the image detection means 4 is the three primary colors of a digital signal This image data inputted also with the image display device 81 with which digital conversion of the three primary colors of the analog signal shown in drawing 1 is inputted and carried out It becomes the same also with the image display device 82 with which digital conversion of the luminance signal SY1 and chrominance signal SC 1 of an analog which were shown in drawing 2 is inputted and carried out, or the image display device 83 with which digital conversion of composite signal SP1 of an analog who showed drawing 3 R> 3 is carried out. furthermore — drawing 2 -- an image display device -- 82 — drawing 3 -- an image display device -- 83 — each — an image display device — 82 — or — 83 — an input — image data — a digital signal — it is — a case — **** — illustrating — having had — A/D conversion — a means (9, or 10 and 12) — instead of — the — digital one — image data — inputting -

- having -- un--- a graphic display -- an input terminal -- preparing -- you may make .

[0043] Each digital image data SR2, SG2, and SB2 is inputted into one input section of each comparison means 21, 23, and 25. Each threshold storage means 22, 24, and 26 are connected to the input section of another side of each comparison means 21, 23, and 25, and the threshold corresponding to each digital image data SR2, SG2, and SB2 is inputted into it. With each comparison means 21, 23, and 25, comparison processing with each digital image data SR2, SG2, and SB2 and the content of storage of each threshold storage means 22, 24, and 26 is carried out, and a comparison result is inputted into the control signal generation means 27. The control signal generation means 27 judges with the value which carried out the value set up beforehand, data processing, etc. from the comparison result of each comparison means 21, 23, and 25, and sends out the control signals CR1, CG1, and CB1 for choosing data smoothing (filter) from the control signal generation means 27 to smoothing means 5-7 to correspond respectively.

[0044] Drawing 6 is drawing showing the internal configuration of the smoothing means 5 of drawing 1 - drawing 4 . In addition, although an input signal differs from an output signal about the smoothing means 6 and 7, the publication which overlaps since it is the smoothing means 5 and this structure as an internal configuration is omitted.

[0045] The smoothing means 5 is constituted by the filter (the 1st filter means 32, 2nd filter means 33) which is two pieces from which the property respectively connected to each output of the selection means 31 which is a 1 input 2 output changeover switch etc., and the selection means 31 differs.

[0046] With the smoothing means 5, image data SR2 of the red of a digital three-primary-colors signal is inputted into the selection means 31. In that case, the output of the selection means 31 is controlled so that either of 2 outputs is chosen by the control signal CR 1 outputted from the control signal generation means 27 of the image detection means 4. Image data SR2 is inputted into the filter means of the direction chosen by the selection means 31, and the output processed with the filter property is outputted to the display means 8 as image data SR3. In addition, suppose that the filter shape when not graduating can also be chosen as a filter shape in this case. That is, outputting as SR3 grade, without carrying out data smoothing (filtering) to the image data SR2 grade to input can also be chosen.

[0047] Drawing 7 is drawing showing the luminance distribution of an example which displayed the image data before data smoothing including the boundary (profile) of dark space and a bright section on the display means 8 without graduating as it is. Drawing 7 (a) Left-hand side is drawing in which right-hand side shows the luminance distribution for every cel at the time of displaying the image of dark space by the bright section, and drawing 7 (b) is drawing in which left-hand side shows the luminance distribution for every cel when right-hand side displays the image of a bright section by dark space. As for setting out of an axis of ordinate and an axis of abscissa, like drawing 29 and drawing 31 , an axis of ordinate shows brightness and an axis of abscissa shows the horizontal position on the screen of the display means 8. Moreover, as for G0e to the cel of red in three primary colors, and G9e, R0e to R9e shows the cel of blue in three primary colors, as for B0e to a green cel in three primary colors and B9e.

[0048] ST0 (R0e --) whose image detection means 4 is the set of the three-primary-colors cel equivalent to 1 pixel in drawing 7 (a) G0e, B0e, and ST1 (R1e, G1e, B1e) and ST2 (R2e, G2e, B-2e) are judged with a bright section, and ST3 (R3e, G3e, B3e) and ST4 (R4e, G4e, B4e) are judged with dark space.

[0049] on the other hand -- drawing 7 (b) -- the image detection means 4 -- ST8 (R8e and G8e --) B8e and ST9 (R9e, G9e, B9e) are judged as a bright section, and ST5 (R5e, G5e, B5e), ST6 (R6e, G6e, B6e), and ST7 (R7e, G7e, B7e) are judged with dark space.

[0050] Moreover, as a bright section of the image which adjoins the dark space of an image, from each above-mentioned judgment result, in drawing 7 (a), ST2 (R2e, G2e, B-2e) is detected, and ST8 (R8e, G8e, B8e) is detected by drawing 7 (b). The image detection means 4 generates and outputs the control signals CR1, CG1, and CB1 over each of the smoothing means 5, 6, and 7 based on this detection result.

[0051] With the gestalt of this operation, data smoothing is selectively carried out with the smoothing

means 5, 6, and 7 to each image data shown in drawing 7 based on the control signals CR1, CG1, and CB1 of the image detection means 4. Since data smoothing can be selectively carried out in the boundary section of the bright section of an image, and dark space by this only to the bright section of the image which adjoins the dark space of an image, a line does not look thin, and the parts of the bright alphabetic character in a dark background or a line are not graduated, but the sharpness of an alphabetic character or a line can be prevented from deteriorating further, even if it displays a dark alphabetic character and a dark line into a bright background.

[0052] Below, the actuation which graduates an image based on the control signal which the image detection means 4 outputs is explained using drawing 8 - drawing 10 R> 0.

[0053] Drawing 8 (a) and (b) are drawings showing an example of the property of the smoothing means 5 and 6 and the smoothing filter used in seven. Setting out of an axis of ordinate, an axis of abscissa, etc. is the same as that of drawing 30 . The filter shape 1 of the filter A shown in drawing 8 (a) is a filter shape used by the bright section of the image which adjoins the dark space of the image which the image detection means 4 detected. This filter shape is the same as that of the conventional smoothing filter fundamentally shown in drawing 30 , brightness decreases about the image data of a bright section, and brightness increases about the pixel data which adjoin that bright section.

[0054] Moreover, the filter shape 2 of the filter B shown in drawing 8 (b) is a filter shape used in parts other than "the bright section of the image which adjoins the dark space of an image" which the image detection means 4 detected. In this filter property, although brightness may decrease about the image data of a bright section, brightness does not increase about the pixel data which adjoin that bright section. That is, although it can be made to graduate about a bright section, it is the property that data smoothing is not carried out about the pixel data which adjoin a bright section. For convenience, the filter property of the filter B in the following operation gestalten is made into the same property as making it pass without carrying out data smoothing of the property, i.e., the image data, that data smoothing is not carried out, also with the image data of a bright section.

[0055] The above-mentioned filter A is applied to the 1st filter means 32 in the smoothing means 5 of drawing 6 , and Filter B is applied to the filter means 32. And Filter A and Filter B are changed with the selection means 31 with a control signal CR 1.

[0056] For example, in the case of each image data before data smoothing of drawing 7 (a) and (b), the filter A of a filter shape 1 shown in drawing 8 (a) to the bright section of ST2 (R2e, G2e, B-2e) and ST8 (R8e, G8e, B8e) is applied. The filter B of the showing [ in drawing 8 (b) ]-to other image data filter shape 2 is applied. Therefore, to the image data of ST2 (R2e, G2e, B-2e) and ST8 (R8e, G8e, B8e), data smoothing of Filter A is carried out and data smoothing is not carried out by other image data.

[0057] Drawing 9 is the smoothing means 5 and 6 by the image detection means 4, and drawing explaining an example of control of seven. Setting out of an axis of ordinate, an axis of abscissa, etc. is the same as that of drawing 8 . When x and y of drawing 9 show the control-element value of the smoothing filters 5-7 by control signals CR1, CG1, and CB1, and the control-element value x and y are not graduated for both sides at the time of 0 but this control-element value x and y become large, extent with which image data is graduated will increase.

[0058] When the image detection means 4 detects "the bright section of the image which adjoins the dark space of an image", specifically, as for the smoothing means 5, 6, and 7, image data is graduated by outputting the any value which fills the following (1) types.

[0059] formula which determines the control element of the bright section of the image which adjoins the dark space of an image 0< x<1 and 0< y<1 however -- x=y and -- x+y<1 Outside of the above-mentioned detection individual reason x=y=0 ... (1)

[0060] Drawing 10 is drawing showing the result of having used the filters A and B of drawing 8 for each image data before data smoothing of drawing 7 (a) and (b), and having performed data smoothing selectively with the image detection means 4.

[0061] The smoothing means 5, 6, and 7 with the control signals CR1, CG1, and CB1 from the image

detection means 4 Only the image data of ST2 (R2f, G2f, B-2f) and ST8 (R8f, G8f, B8f) is graduated with Filter A out of the digital image data in three primary colors shown in drawing 7 (a) and (b), and it is made not to graduate with Filter B about other image data.

[0062] Although brightness decreases, only the image data of ST2 (R2f, G2f, B-2f) and ST8 (R8f, G8f, B8f) of drawing 10 (a) and (b) only a reduction component (R2g, G2g, B-2g) and a reduction component (R8g, G8g, B8g) specifically About the image data of ST1 (R1g, G1g, B1g) and ST9 (R9g, G9g, B9g) which adjoins the image data of ST2 and ST8 and which is a bright section ST3 (R -- 3g) which is the dark space which reduction in brightness is lost and adjoins reverse at the image data of ST2 and ST8 About the image data of G3g, B3g, and ST7 (R7g, G7g, B7g), the increment in the brightness of an increment component (R3g, G3g, B3g) and an increment component (R7g, G7g, B7g) is lost.

[0063] Next, actuation of the image display device 81 of drawing 1 is explained. Moreover, especially actuation of an image display device 4 is explained using drawing 5 and drawing 6 with drawing 11 . If image data SR1 of red (the 1st color) in three primary colors is inputted into an image display device 81, the A/D-conversion means 1 will be sampled on the predetermined frequency corresponding to the data format of inputted image data SR1, and will be changed into digital image data SR2. Similarly, the A/D-conversion means 2 samples the image data [ being green (the 2nd color) ] SG1 in three primary colors, changes it into the digital image data SG2, and the A/D-conversion means 3 samples image data SB1 of blue (the 3rd color) in three primary colors, and it changes it into digital image data SB2.

[0064] The image data (SR2, SG2, SB2) changed with the A/D-conversion means 1-3 is respectively inputted also into the image detection means 4 with the smoothing means 5, 6, and 7.

[0065] Hereafter, the image detection means 4 is explained using drawing 11 R> 1 which is the flow chart which shows actuation of the image detection means 4 of drawing 1 . In addition, in that case, drawing 1 , drawing 5 , and drawing 6 are referred to.

[0066] With the image detection means 4, the existence of image data (SR2, SG2, SB2) in three primary colors to the inputted image data is detected (step S1). When there is image data (step S1: YES) It judges whether input image data is the dark space of an image by comparing whether each input image data is smaller than the threshold beforehand set up in the threshold storage means (22, 24, 26) with a comparison means (21, 23, 25) (step S2). When there is no image data (step S1: NO), it progresses to step S6.

[0067] For example, when input image data SR2 is the dark space of an image (step S2: YES), it changes to the 2nd filter means (filter B) side which does not graduate the selection means 31 within the smoothing means 5 with the control signal CR 1 of the image detection means 4 (step S3), and image data SR3 which brings a processing result of Filter B is outputted to the display means 8 from the smoothing means 5. The image data SG3 and SB3 by which filter processing of the control signal was changed and carried out for the smoothing means 6 and the selection means in seven by CG1 and CB1 about other input image data SG2 and SB2 is outputted. Hereafter, since explanation of each input image data SR2, SG2, and SB2 overlaps, only SR2 is explained as a representative.

[0068] When the level value of input image data SR2 is larger than the threshold set up beforehand and it is not the dark space of an image (step S2: NO) (that is, it is a bright section), it is judged by investigating the image data before and behind the input image data SR2 whether it is "the bright section which adjoins dark space" (step S4). When input image data SR2 is "the bright section which adjoins dark space" (step S4: YES), a control signal CR 1 is sent out so that the filter A which is the 1st filter means within the smoothing means 5 may be chosen from the image detection means 4. The selection means 31 within the smoothing means 5 is changed to a 1st filter means (filter A) side by the control signal CR 1 (step S5). And image data SR3 which brings a processing result of Filter A is outputted to the display means 8 from the smoothing means 5.

[0069] On the other hand, when input image data SR2 is not "the bright section which adjoins dark space" (step S4: NO), processing of step S3 is carried out, a control signal CR 1 is sent out so that the filter B which is the 2nd filter means within the smoothing means 5 may be chosen from the image

detection means 4, and the selection means 31 within the smoothing means 5 is changed to a 2nd filter means (filter B) side by the control signal CR 1. And image data SR3 which brings a processing result of Filter B is outputted to the display means 8 from the smoothing means 5.

[0070] Then, when it is judged whether image data was completed (step S6), processing is ended when image data is completed (step S6: YES), and image data is not completed (step S6: NO), it returns to step S1 again, and image data is detected.

[0071] With the gestalt of this operation, since it operates as mentioned above, data smoothing can be carried out only to the image data of "the bright section which adjoins dark space."

[0072] Here, the image display device 82 of drawing 2 explains different actuation from the image display device 81 of drawing 1 .

[0073] A luminance signal SY1 is inputted into the A/D-conversion means 9, and a chrominance signal SC 1 is inputted into the A/D-conversion means 10. The A/D-conversion means 9 and 10 sample the luminance signal SY1 and chrominance signal SC 1 which were inputted on a predetermined frequency, and change them into a digital luminance signal SY2 and a digital chrominance signal SY2 respectively. The luminance signal SY2 and chrominance signal SY2 which were changed with the A/D-conversion means 9 and 10 are inputted into the matrix means 11, and are changed into the image data SR2, SG2, and SB2 in three primary colors. The image data SR2, SG2, and SB2 in three primary colors changed with the matrix means 11 is respectively inputted into the image detection means 4 and the smoothing means 5, 6, and 7. Since subsequent actuation becomes being the same as that of actuation of the image display device 81 of drawing 1 , explanation is omitted.

[0074] Next, the image display device 83 of drawing 3 explains different actuation from the image display device 81 of drawing 1 .

[0075] It is inputted into the A/D-conversion means 12, and composite signal SP1 samples inputted composite signal SP1 on a predetermined frequency, and changes the A/D-conversion means 12 into digital composite signal SP2. Composite signal SP2 changed with the A/D-conversion means 12 is inputted into the Y/C separation means 13, and is divided into a luminance signal SY2 and a chrominance signal SC 2. The luminance signal SY2 and chrominance signal SC 2 which were separated with the Y/C separation means 13 are inputted matrix means 11, and are changed into the image data SR2, SG2, and SB2 in three primary colors. Since subsequent actuation is the same as that of the image display device 82 of drawing 2 , explanation of operation is omitted.

[0076] Next, the image display device 84 of drawing 4 explains different actuation from the image display device 81 of drawing 1 .

[0077] Image data SR2 of the red of the digital signal which constitutes the three primary colors is inputted into an input terminal 15 as digital image data of the 1st color, the green image data SG2 as digital image data of the 2nd color is inputted into an input terminal 16, and blue image data SB2 is inputted into an input terminal 17 as digital image data of the 3rd color. Inputted image data SR2 is inputted into the image detection means 4 and the smoothing means 5, image data SG2 is inputted into the image detection means 4 and the smoothing means 6, and image data SB2 is inputted into the image detection means 4 and the smoothing means 7. Since subsequent actuation is the same as that of the image display device 81 of drawing 1 R> 1, explanation of operation is omitted.

[0078] in addition, in explanation of the above-mentioned actuation, about all the image data SR2, SG2, and SB2 in three primary colors inputted in the image detection means 4 Although it judged as dark space of the image displayed on the display means 8 by the image data when smaller than the threshold beforehand set as the threshold storage means 22, 24, and 26 For example, only the minimum value in the inputted image data SB [ SR2 SG2, and ] 2 in three primary colors is judged, and when the image data is smaller than a threshold, you may judge with the dark space of an image.

[0079] Thus, since the brightness of the bright section which adjoined without raising the brightness of the dark space of an image can be reduced, the image display device of the gestalt 1 of this operation can improve the phenomenon a line looks thinly, when a dark alphabetic character and a dark line are

displayed on a bright background.

[0080] Although the image detection means 4 explained the case where "the bright section which adjoins the dark space of an image" was detected from the image data SR2, SG2, and SB2 in three primary colors, this invention may not be restricted to this, and it may consist of gestalten 1 of the gestalt 2. above-mentioned implementation of operation so that the bright section of the image which adjoins the dark space of an image from the data of the luminance signal in image data may be detected like the gestalt 2 of operation shown below.

[0081] Drawing 12 is drawing showing the image display device in the gestalt 2 of operation of this invention. The image display device 85 of drawing 12 a different point from the image display device 81 of the gestalt 1 of operation The point that a luminance-signal calculation means 15 to compute and output the digital luminance signal SY2 based on image data SR2, SG2, and SB2 is added, With the image detection means 4 of the gestalt 1 of operation shown in drawing 1 - drawing 4 , an image detection means 4 by which the dark space of an image was judged from the digital image data SR2, SG2, and SB2 in three primary colors is the point changed into an image detection means 14 to judge the dark space of an image from a luminance signal SY2.

[0082] By processing hard flow of the processing which drawing 2 and the image display device 82 of drawing 3 , and the matrix means 11 in 83 carry out, the luminance-signal calculation means 15 calculates based on the image data SR2, SG2, and SB2 outputted from the A/D-conversion means 1-3, and computes the luminance signal SY2 of a digital signal. Moreover, about the internal configuration of the image detection means 14, it mentions later using drawing 15 .

[0083] Drawing 13 and 14 are the block diagrams showing the image display device of other configurations in the gestalt 2 of operation of this invention. Although the luminance-signal calculation means 15 was added in order that a different point from the image display device 85 of drawing 12 might calculate in the image display device 85 of drawing 12 based on image data SR2, SG2, and SB2 and the image display device 86 of drawing 13 might compute the luminance signal SY2 of a digital signal Since image data from the first is the luminance signal SY1 of an analog like the image display device 82 of drawing 2 in an image display device 86, It is the point that the luminance signal SY2 of the digital signal outputted from the A/D-conversion means 9 is constituted so that it may be inputted into the image detection means 14, and the luminance-signal calculation means 15 is unnecessary. Therefore, about the configuration of the image detection means 14, it becomes being completely the same as that of an image display device 85. Moreover, since other configurations are the same as that of the image display device 85 of drawing 12 , explanation is omitted.

[0084] The point that the image display device 87 of drawing 14 differs from the image display device 86 of drawing 13 is a point that the Y/C separation means 13 for separating a luminance signal SY2 is added like the image display device 83 of drawing 3 R> 3 from composite signal SP2 by whom digital conversion was done since image data from the first is composite signal SP1 who doubled the luminance signal and the chrominance signal, in an image display device 87, although the luminance signal SY2 of a digital signal was outputted from the A/D-conversion means 9 in the image display device 86 of drawing 13 . Therefore, about the configuration of the image detection means 14, it becomes being completely the same as that of an image display device 85. Since other configurations are the same as that of the image display device 86 of drawing 13 , explanation is omitted.

[0085] Drawing 15 is drawing showing the internal configuration of the image detection means 14 of drawing 12 - drawing 14 . The image detection means 14 is constituted by the comparison means 41 corresponding to the luminance signal of a digital signal which consists of a comparator etc., for example, and the threshold storage means 42 which consists of memory etc. and a control signal generation means 47 which consists of a microprocessor etc., for example to generate control signals CR1, CG1, and CB1 from the comparison result of the comparison means 41. In addition, control signals CR1, CG1, and CB1 are control signals for choosing the filter which carries out data smoothing to the image data SR2, SG2, and SB2 for every color in three primary colors.

[0086] Next, actuation of the image display device of the gestalt of this operation is explained. Since the difference of actuation between the image display device of the gestalt 1 of operation and the image display device of the gestalt of this operation is only a difference from the image detection means 14 of actuation of the image detection means 4 of the gestalt 1 of operation, and the gestalt 2 of operation, only actuation of image detection equipment 14 is explained below, and other explanation of operation is omitted.

[0087] A luminance signal SY2 is inputted into one input section of the comparison means 41 in the image detection equipment 14 of drawing 15 . The threshold storage means 42 is connected to the input section of another side of the comparison means 41, and the threshold corresponding to a luminance signal SY2 is inputted into it. With the comparison means 41, comparison processing with a luminance signal SY2 and the content of storage of the threshold storage means 42 is carried out, and a comparison result is inputted into the control signal generation means 47. The control signal generation means 47 judges with the value which carried out the value set up beforehand, data processing, etc. from the comparison result of the comparison means 41, and sends out the control signals CR1, CG1, and CB1 for choosing data smoothing (filter) from the control signal generation means 47 to smoothing means 5-7 to correspond respectively.

[0088] When a luminance signal SY2 is smaller than the threshold set up beforehand, it judges with the image data SR2, SG2, and SB2 corresponding to the luminance signal SY2 being the dark space in a display image, and when a luminance signal SY2 is larger than a threshold, the image data SR2, SG2, and SB2 corresponding to the luminance signal SY2 judges with the bright section in a display image conversely. And the image detection means 14 detects the bright section of the image which adjoins the dark space of an image like the gestalt 1 of operation from the image data of the dark space of the image judged as mentioned above, and a bright section. Other actuation is the same as actuation of the gestalt 1 of the above-mentioned implementation.

[0089] Thus, since the brightness of the bright section which adjoined without raising the brightness of the dark space of an image can be reduced even if it is the case where it constitutes so that the bright section of the image which adjoins the dark space of an image from the data of the luminance signal in image data in an image detection means may be detected, the image display device of the gestalt 2 of this operation can improve the phenomenon a line looks thinly, when a dark alphabetic character and a dark line are displayed on a bright background.

[0090] Although the image detection means 4 or the image detection means 14 explained the case where the bright section of the image which adjoins the dark space of an image was detected, this invention may not be restricted to this, and it may consist of gestalten 1 and 2 of the gestalt 3. above-mentioned implementation of operation so that the bright section of the image which adjoins the profile of an image may be detected like the gestalt 3 of operation shown below.

[0091] Drawing 16 is drawing showing the image detection means in the image display device in the gestalt 3 of operation of this invention. In addition, the image detection means of the gestalt 3 of this operation can be replaced and used for the image detection means 4 in the image display device of the arbitration of the gestalt 1 of operation shown in drawing 1 - drawing 4 .

[0092] The primary difference of the image detection means 24 of the gestalt 3 of this operation and the image detection means 4 of the gestalt 1 of operation shown in drawing 5 R> 5 Primary differential means 43, 48, and 53 to perform primary differential processing to each image data SR2, SG2, and SB2 to input, It is the point that threshold storage means 45, 50, and 55 to memorize a threshold for predetermined comparison means 44, 49, and 54 in comparison with a threshold and comparison means 44, 49, and 54 of those to compare the output of the primary differential means 43, 48, and 53 are added. Moreover, the control signal generation means 56 not only can detect the bright section of the image which adjoins the dark space of an image like the gestalt 1 of operation, or 2, but in connection with it, it differs in that the profile of an image is detectable with the output of the comparison means 44, 49, and 54.

[0093] Moreover, about the configuration of the comparison means 41, 46, and 51 in the image detection means 24 of drawing 16 , and the threshold storage means 42, 47, and 52, it corresponds to the configuration of the comparison means 21, 23, and 25 in the image detection means 4 of the gestalt 1 of operation shown in drawing 5 , and the threshold storage means 22, 24, and 26 respectively.
[0094] Next, detection actuation of the bright section of the image which adjoins the profile of the image in the image detection means 24 is explained.
[0095] Drawing 17 is a flow chart which shows actuation of the image detection means 24 of drawing 16 . Since it is the same as that of step S1 to the step S3 of the gestalt 1 of the operation which showed step S13 respectively to drawing 11 from step S11 of drawing 17 and is the same as that of step S5 to the step S6 of the gestalt 1 of the operation which showed step S16 respectively to drawing 11 from step S15 of drawing 17 , explanation is omitted. Therefore, only step S14 of the gestalt 3 of this operation transposed to step S4 of the gestalt 1 of operation is explained.
[0096] At step S14, since it became clear from the decision result of step S13 that image data was a bright section, it judges whether the image data is the profile section. When image data is the profile section (step S14: YES), it progresses to step S15 and Filter A is chosen, when image data is not the profile section (step S14: NO), it progresses to step S13 and Filter B is chosen.
[0097] Here, it explains in more detail about the decision approach of whether the image data in the image detection means 24 is the profile section.
[0098] In the primary differential means 43, 48, and 53 of the image detection means 24, the primary inputted image data SR2, SG2, and SB2 in three primary colors is differentiated in the property of arbitration. The primary differential result of the primary differential means 43, 48, and 53 is compared with each threshold which was beforehand set as the threshold storage means 45, 50, and 55, and was stored in them in the comparison means 44, 49, and 54. When the primary differential result of the primary differential means 43, 48, and 53 is larger than each threshold, in the control signal generation means 56, it is judged with image data SR2, SG2, and SB2 being the profile of an image with the output from the comparison means 44, 49, and 54.
[0099] On the other hand, image data SR2, SG2, and SB2 is compared with each threshold which was beforehand set as the threshold storage means 42, 47, and 52, and was stored in them in the comparison means 41, 46, and 51. Like the gestalt 1 of operation, or 2, the comparison result here judges that image data SR2, SG2, and SB2 is the bright section of an image in the control signal generation means 56 with the output from the comparison means 41, 46, and 51, when image data SR2, SG2, and SB2 is larger than each threshold.
[0100] And the control signal generation means 56 is further based on the above-mentioned judgment result of the profile of an image and the above-mentioned judgment result of the bright section of an image. As opposed to the image data SR2, SG2, and SB2 corresponding to the bright section of the image which detects the bright section which adjoins the profile of an image and adjoins the profile of the detected image As shown in drawing 9 of the gestalt 1 of operation, a control element x and the control signals CR1, CG1, and CB1 containing y are generated, and it outputs to the smoothing means 5, 6, and 7. Since subsequent actuation is the same as that of the gestalt 1 of operation, explanation is omitted.
[0101] Although explanation of actuation of the above-mentioned gestalt of this operation explained the case where the control signals CR1, CG1, and CB1 of any value were generated and outputted as the control element x of the smoothing means 5, 6, and 7, and y in the bright section of the image which adjoins the profile of the image which the image detection means 24 detected here A control element x and y can be determined based on the differential result of the primary differential means 43, 48, and 53, and control signals CR1, CG1, and CB1 can be generated. The control element x and the decision approach of y are explained below.
[0102] In the image detection means 24, primary differential for every color is performed based on two transfer functions shown in the following (2) types.

[0103]
H1(z) =1-z+1 However, H1(z) >=0 H2(z) =1-z-1 However, H2(z) >=0 ... (2)
[0104] Next, from two differential results by the above-mentioned (2) formula for every color, the differential result of the larger one is chosen respectively, the average of three selected values for every color is multiplied by the multipliers j and k of arbitration, and x and y are determined.
[0105] for example, the differential result for every color -- red (rh1, rh2) -- if it is green (gh1, gh2) and blue (bh1, bh2), the following (3) types can show x and y.
[0106]
dr=max (rh1, rh2)
dg=max (gh1, gh2)
db=max (bh1, bh2)
x=jx (dr+dg+db)/3 y=kx (dr+dg+db)/3 : max (a, b) shows selection with larger a and b. ... (3)
[0107] In addition, although the above-mentioned (3) formula showed how to compute the control element x in the control signals CB [ CR1 CG1, and ] 1 of the smoothing means 5, 6, and 7, and y, the calculation approach which does not restrict a control element x and the calculation approach of y to this, and chooses maximum or the minimum value from the differential result for every color, for example, multiplies the selected value by the multiplier of arbitration may be used.
[0108] Moreover, although explanation of the above-mentioned actuation showed how to detect the bright section of the image which adjoins the profile of an image by judging the bright section of an image from other thresholds which judged the profile of an image from the threshold set up beforehand, and were set up beforehand The detection approach is not what is restricted above. For example, a primary differential result Since a value will become large if the brightness of the bright section which adjoins a profile is high, and a value will become small if brightness is low You may make it generate the control signal over the smoothing means 5, 6, and 7, without setting up a threshold and judging the profile and bright section of an image, as the bright section of the image which adjoins the profile of an image only using the above-mentioned primary differential result is detected and was described above.
[0109] Moreover, although the image detection means 24 explained how to determine the control element x in the control signals CB [ CR1 CG1, and ] 1 the smoothing means 5 - for seven, and y from the image data SR2, SG2, and SB2 in three primary colors, by explanation of the above-mentioned actuation For example, when applying the above to the control element x in control signals CB [ CR1 CG1, and ] 1, and an image detection means 14 to determine y, from a luminance signal SY2 like the gestalt 2 of operation, you may constitute so that only the primary differential result of a luminance signal SY2 may be used.
[0110] moreover -- a book -- operation -- a gestalt -- three -- **** -- image data -- SR -- two -- SG -- two -- SB -- two -- or -- a luminance signal -- SY -- two -- one -- order -- differential -- a result -- ******** -- the above -- (-- two --) -- a formula -- a transfer function -- using -- having explained -- although -- this invention -- this -- restricting -- a thing -- it is not -- arbitration -- a transfer function -- one -- order -- having differentiated -- a result -- it can use .
[0111] With the gestalt 3 of this operation, since it operates as mentioned above, data smoothing can be carried out only to the image data of "the bright section of the image which adjoins the profile of an image."
[0112] Although the gestalten 1 and 2 of the operation whose gestalt 4. above operation did explained the case where the bright section of the image with which the image detection means 4 and the image detection means 14 judge the dark space of an image based on the threshold set up beforehand, and adjoin the dark space of an image was detected This invention may not be restricted to this, and it may be constituted so that the bright section of the image which adjoins the dark space of the image below the width of face of arbitration may be detected like the gestalt 4 of operation shown below.
[0113] Drawing 18 is drawing showing the image detection means in the image display device in the gestalt 4 of operation of this invention. In addition, the image detection means of the gestalt 4 of this

operation can be replaced and used for the image detection means 4 in the image display device of the arbitration of the gestalt 1 of operation shown in drawing 1 - drawing 4 .

[0114] The primary difference of the image detection means 34 of the gestalt 4 of this operation and the image detection means 24 of the gestalt 3 of operation shown in drawing 1616 What was primary differential means 43, 48, and 53 to perform primary differential processing to each image data SR2, SG2, and SB2 inputted with the image detection means 24 of drawing 16 It is the point changed into secondary differential means 63, 68, and 73 to perform secondary differential processing to each image data SR2, SG2, and SB2 to input. Moreover, in connection with it, the points changed so that the control signal generation means 86 not only can detect the bright section of the image which adjoins the dark space of an image like the gestalt 1 of operation or 2, but the image which adjoins the dark space of the image below the width of face of arbitration with the output of the comparison means 44, 49, and 54 can be detected also differ.

[0115] Moreover, about the configuration of the comparison means 61, 64, 66, 69, 71, and 74 in the image detection means 34 of drawing 18 , and the threshold storage means 62, 65, 67, 70, 72, and 75, it corresponds to the configuration of the comparison means 41, 44, 46, 49, 51, and 54 in the image detection means 24 of the gestalt 3 of operation shown in drawing 16 , and the threshold storage means 42, 45, 47, 50, 52, and 55 respectively.

[0116] Drawing 19 (a) and (b) are drawings showing the result of having graduated the image data before data smoothing shown in drawing 29 (a) and (b) with the image display device of this operation gestalt. Drawing 19 R> 9 (a) is drawing showing the luminance distribution for every cel at the time of displaying the image of a white line into a black background using the display means of the image display device of the gestalt 4 of this operation, and drawing 19 (b) is drawing showing the luminance distribution for every cel at the time of displaying the image of a black line into a white background using the display means of the image display device of the gestalt 4 of this operation. Moreover, setting out of the axis of abscissa of drawing 19 (a) and (b), an axis of ordinate, etc. is the same as that of drawing 29 .

[0117] drawing 19 (a) -- the image detection means 34 of drawing 18 -- ST0 (R -- 0m) G0m, B0m -- ST1 (R1m, G1m, B1m), and ST3 (R3m, G3m, B3m)-ST4 (R4m, G4m, B4m) Since it is not judged as dark space of the image below the width of face of arbitration, the smoothing means 5, 6, and 7 do not carry out data smoothing to the image data of ST0-ST4.

[0118] In drawing 19 (b), by the image detection means 34 of drawing 18 , since ST7 (R7m, G7m, B7m) is judged as dark space of the image below the width of face of arbitration, ST6 (R6m, G6m, B6m) and ST8 (R8m, G8m, B8m) are detected as a bright section of the image which adjoins the dark space of the image below the width of face of arbitration. Consequently, the smoothing means 5, 6, and 7 carry out data smoothing only to the image data corresponding to the parts of ST6 (R6m, G6m, B6m) and ST8 (R8m, G8m, B8m). therefore, about ST1 (R1m, G1m, B1m), ST2 (R2m, G2m, B-2m), ST3 (R3m, G3m, B3m), and ST7 (R7m, G7m, B7m) Data smoothing is not carried out but the increment components ST1 (R1n, G1n, B1n), ST3 (R3n, G3n, B3n), and ST7 (R7n, G7n, B7n) and the reduction nature ST 2 (R2n, G2n, B-2n) stop appearing in the output of the smoothing means 5, 6, and 7.

[0119] Next, detection actuation of the bright section of the image which adjoins the dark space of the image below the width of face of the arbitration in the image detection means 34 is explained.

[0120] Drawing 20 is a flow chart which shows actuation of the image detection means 34 of drawing 18 . Since it is the same as that of step S1 to the step S3 of the gestalt 1 of the operation which showed step S23 respectively to drawing 11 from step S21 of drawing 20 and is the same as that of step S5 to the step S6 of the gestalt 1 of the operation which showed step S26 respectively to drawing 11 from step S25 of drawing 20 , explanation is omitted. Therefore, only step S24 of the gestalt 4 of this operation transposed to step S4 of the gestalt 1 of operation is explained.

[0121] At step S24, since it became clear from the decision result of step S23 that image data was a bright section, the image data judges whether it is the image which adjoins the dark space of the image below the width of face of arbitration. In not being the image with which it progresses to step S25, and

Filter A is chosen when image data is the image which adjoins the dark space of the image below the width of face of arbitration (step S24: YES), and image data adjoins the dark space of the image below the width of face of arbitration (step S24: NO), it progresses to step S23 and chooses Filter B.
[0122] Here, the image data in the image detection means 34 explains in more detail about the decision approach of whether to be the bright section of the image which adjoins the dark space of the image below the width of face of arbitration.
[0123] In the secondary differential means 63, 68, and 73 of the image detection means 34, the secondary inputted image data SR2, SG2, and SB2 in three primary colors is differentiated in the property of arbitration. The secondary differential result of the secondary differential means 63, 68, and 73 is compared with each threshold which was beforehand set as the threshold storage means 65, 70, and 75, and was stored in them in the comparison means 64, 69, and 74. When the secondary differential result of the secondary differential means 63, 68, and 73 is larger than each threshold, it is judged with it being the image by which image data SR2, SG2, and SB2 adjoins the dark space of the image below the width of face of arbitration in the control signal generation means 76 with the output from the comparison means 64, 69, and 74.
[0124] On the other hand, image data SR2, SG2, and SB2 is compared with each threshold which was beforehand set as the threshold storage means 62, 67, and 72, and was stored in them in the comparison means 61, 66, and 71. Like the gestalt 1 of operation, or 2, the comparison result here judges that image data SR2, SG2, and SB2 is the bright section of an image in the control signal generation means 76 with the output from the comparison means 61, 66, and 71, when image data SR2, SG2, and SB2 is larger than each threshold.
[0125] And the control signal generation means 76 is based on the judgment result of an image and the judgment result of the bright section of an image which adjoin the dark space of the image below the width of face of the above-mentioned arbitration further. As opposed to the image data SR2, SG2, and SB2 corresponding to the bright section of the image which detects the bright section of the image which adjoins the dark space of the image below the width of face of arbitration, and adjoins the dark space of the image below the width of face of the detected arbitration As shown in drawing 9 of the gestalt 1 of operation, a control element x and the control signals CR1, CG1, and CB1 containing y are generated, and it outputs to the smoothing means 5, 6, and 7. Since subsequent actuation is the same as that of the gestalt 1 of operation, explanation is omitted.
[0126] When a dark alphabetic character and a dark line are displayed on a bright background because the result drawing 19 carried out [ the result ] data smoothing determines the filter shape of each color so that the following (4) types may be filled, while improving the phenomenon a line looks thinly more in detail, lowering of the sharpness in a profile part can be decreased.
[0127]
R6>G6>B6R8<G8<B8 ... (4)
[0128] By explanation of actuation of the above-mentioned gestalt 4 of this operation here Although the case where the control signals CR1, CG1, and CB1 of any value were generated and outputted as the control element x of the smoothing means 5, 6, and 7 and y in the bright section of the image which adjoins the dark space of the image below the width of face of the arbitration which the image detection means 34 detected was explained A control element x and y can be determined based on the differential result of the secondary differential means 63, 68, and 73, and control signals CR1, CG1, and CB1 can be generated. The control element x and the decision approach of y are explained below.
[0129] More specifically in the image detection means 34, secondary differential for every color is performed based on two transfer functions shown in the following (5) types.
[0130]
H3 (z) = (1+z-2) / 2-z-1 However, H3(z) >=0 H4 (z) = (1+z+2) / 2-z+1 However, H4(z) >=0 ... (5)
[0131] Next, from two differential results by the above-mentioned (5) formula for every color, the differential result of the larger one is chosen respectively, the average of three selected values for

every color is multiplied by the multipliers j and k of arbitration, and x and y are determined.
[0132] for example, the differential result for every color -- red (rh3, rh4) -- if it is green (gh3, gh4) and blue (bh3, bh4), the following (6) types can show x and y.
[0133]
dr=max (rh3, rh4)
dg=max (gh3, gh4)
db=max (bh3, bh4)
x=jx (dr+dg+db)/3 y=kx (dr+dg+db)/3 max (a, b) shows selection with larger a and b. ... (6)
[0134] In addition, although the above-mentioned (6) formula showed how to compute the control element x in the control signals CB [ CR1 CG1, and ] 1 of the smoothing means 5, 6, and 7, and y, the calculation approach which does not restrict a control element x and the calculation approach of y to this, and chooses maximum or the minimum value from the differential result for every color, for example, multiplies the selected value by the multiplier of arbitration may be used.
[0135] Moreover, although explanation of the above-mentioned actuation showed how to detect the bright section of the image which adjoins the dark space of the image below the width of face of arbitration by judging the bright section of an image from other thresholds which judged the dark space of the image below the width of face of arbitration from the threshold set up beforehand, and were set up beforehand The detection approach is not what is restricted above. For example, a secondary differential result Since a value becomes large so that the width of face of the dark space of an image is narrow and the brightness of the bright section of an adjoining image is high You may make it generate the control signal over the smoothing means 5, 6, and 7, without setting up a threshold and judging the dark space of the image below the width of face of arbitration, and the bright section of an image, as the bright section of the image which adjoins the profile of an image only using the above-mentioned secondary differential result is detected and was described above.
[0136] Moreover, although the image detection means 24 explained how to determine the control element x in the control signals CB [ CR1 CG1, and ] 1 the smoothing means 5 - for seven, and y from the image data SR2, SG2, and SB2 in three primary colors, by explanation of the above-mentioned actuation For example, when applying the above to the control element x in control signals CB [ CR1 CG1, and ] 1, and an image detection means 14 to determine y, from a luminance signal SY2 like the gestalt 2 of operation, you may constitute so that only the secondary differential result of a luminance signal SY2 may be used.
[0137] moreover -- a book -- operation -- a gestalt -- four -- **** -- image data -- SR -- two -- SG -- two -- SB -- two -- or -- a luminance signal -- SY -- two -- two -- order -- differential -- a result -- ******** -- the above -- (-- five --) -- a formula -- a transfer function -- using -- having explained -- although -- this invention -- this -- restricting -- a thing -- it is not -- arbitration -- a transfer function -- two -- order -- having differentiated -- a result -- it can use .
[0138] With the gestalt 4 of this operation, since it operates as mentioned above, data smoothing can be carried out only to the image data of "the bright section of the image which adjoins the dark space of the image below the width of face of arbitration."
[0139] Thus, since the brightness of the bright section which adjoined without raising the brightness of the dark space of an image can be reduced, the image display device of the gestalt 4 of this operation can improve the phenomenon a line looks thinly, when a dark alphabetic character and a dark line are displayed on a bright background.
[0140] In addition, although the above-mentioned explanation explained the case where secondary differential was used, as the detection approach of the bright section of the image which adjoins the dark space of the image below the width of face of arbitration Restrict this invention to this and it distinguishes the bright section of an image, and the dark space of an image like the gestalt 1 of operation based on a threshold that there is nothing. It identifies that the dark space of the image is below the width of face of arbitration, and you may make it detect the bright section of the image which

adjoins the dark space of the image below the width of face of the identified arbitration by measuring the width of face of the dark space of the distinguished image.
[0141] Moreover, it identifies that the dark space of the image is below the width of face of arbitration, and you may make it detect the bright section of the image which adjoins the dark space of the image below the width of face of the identified arbitration by, for example, comparing the dark space of the image distinguished based on the threshold with two or more patterns which consisted of binary.
[0142] Operation the gestalt 5. above with the gestalten 1-4 of the operation carried out Although the case where "the bright section of the image which adjoins the dark space of an image", "the bright section of the image which adjoins the profile of an image", and "the bright section of an image which adjoins the dark space of the image below the width of face of arbitration" were graduated with the smoothing means 5, 6, and 7 using the filter of a filter shape shown in drawing 8 (a) and (b) was shown This invention cannot be restricted to this and can also be graduated like the gestalt 5 of operation shown below using the filter of a different property for every three primary colors.
[0143] Drawing 21 is drawing showing an example of the property of the smoothing means 5 and 6 and the smoothing filter of a different property for every three primary colors used in seven. The filter shape FG3 more specifically used for the smoothing means 6 for green (the 2nd color) shown in drawing 21 (filter C) is the same property as FG1 of the filter shape 1 shown in drawing 8 (a) and (Filter A).
[0144] Moreover, the any value which fills the following (7) types should just be used for filter shape FR1 used for the smoothing means 5 for red (the 1st color) shown in drawing 21 (filter C).
[0145]
0< x<1 and 0<=y<1 however -- x>y and -- x+y<1 ... (7)
[0146] Moreover, the any value which fills the following (8) types should just be used for the filter shape FB3 used for the smoothing means 7 for blue (the 3rd color) shown in drawing 21 (filter C).
[0147]
0<=x<1 and 0< y<1 however -- x<y and -- x+y<1 ... (8)
[0148] Drawing 22 is drawing showing the result of having used the filter C of drawing 21, and the filter B of drawing 8 for each image data before data smoothing of drawing 7 (a) and (b), and having performed data smoothing selectively with the image detection means 4.
[0149] The smoothing means 5, 6, and 7 with the control signals CR1, CG1, and CB1 from the image detection means 4 Only the image data of ST2 (R2f, G2f, B-2f) and ST8 (R8f, G8f, B8f) is graduated with Filter C out of the digital image data in three primary colors shown in drawing 7 (a) and (b), and it is made not to graduate with Filter B about other image data.
[0150] Since the phases of each color specifically differ by the filter shape of drawing 21 only from the image data of ST2 (R2j, G2j, B-2j) and ST8 (R8j, G8j, B8j) of drawing 22 (a) and (b), Although brightness decreases, only a different reduction component (G2k, B-2k) and a different reduction component (R8k, G8k) About the image data of ST1 (R1j, G1j, B1j) and ST9 (R9j, G9j, B9j) which adjoins the image data of ST2 and ST8 and which is a bright section Reduction in brightness is lost and the increment in the brightness of an increment component (R3k, G3k) and an increment component (G7k, B7k) is lost about the image data of ST3 (R3j, G3j, B3j) and ST7 (R7j, G7j, B7j) which adjoins the image data of ST2 and ST8 and which is dark space.
[0151] Drawing 23 (a) and (b) are drawings showing the result of having graduated the image data before data smoothing shown in drawing 29 (a) and (b) with the image display device of this operation gestalt. Drawing 23 R> 3 (a) is drawing showing the luminance distribution for every cel at the time of displaying the image of a white line into a black background using the display means of the image display device of the gestalt 5 of this operation, and drawing 23 (b) is drawing showing the luminance distribution for every cel at the time of displaying the image of a black line into a white background using the display means of the image display device of the gestalt 5 of this operation. Moreover, setting out of the axis of abscissa of drawing 23 (a) and (b), an axis of ordinate, etc. is the same as that of drawing 29 .
[0152] In drawing 23 (a), the smoothing means 5, 6, and 7 do not carry out data smoothing to the image

data of ST0-ST4 like drawing 19 (a).
[0153] Like drawing 19 (b), although the smoothing means 5, 6, and 7 carry out data smoothing to the image data of ST6 and ST8, since the phases of each color differ, at drawing 23 (b), only G6p in ST6, G8p in B6 ST [ p and ]8, and R8p are graduated by the filter shape of drawing 21. therefore, about ST1 (R1p, G1p, B1p), ST2 (R2p, G2p, B-2p), ST3 (R3p, G3p, B3p), and ST7 (R7p, G7p, B7p) Data smoothing is not carried out but R2q, G2q, and B-2q in R7 q, G7q and B7q, or the reduction component ST 2 in G1q in the increment component ST 1, R3q in B1q and ST3, and G3 ST [ q and ]7 stop appearing in the output of the smoothing means 5, 6, and 7.
[0154] The filter shape for every color is determined so that the following (9) types may be filled as a result of smoothing in more detail.
[0155]
R2>G2>B-2B8>G8> R8 ... (9)
[0156] In addition, although input image data showed the case of the digital image data which consists of the three primary colors by explanation of the above-mentioned actuation, the gestalt of this operation may not be restricted to this and may be applied to the digital image data and the digital image data of a composite which consist of brightness and a color.
[0157] With the gestalt 5 of this operation, since it operates as mentioned above, data smoothing can be carried out using the filter of a different property for every three primary colors, and lowering of the sharpness of an image can be decreased further.
[0158] Although the case where the bright section of the image which adjoins the dark space of an image from the data of the luminance signal in image data was detected was explained, this invention may not be restricted to this and may consist of gestalten 2 of the gestalt 6. above-mentioned implementation of operation like the gestalt 6 of operation shown below.
[0159] Drawing 24 is drawing showing the image display device in the gestalt 6 of operation of this invention. The image display device 88 of drawing 24 a different point from the image display device 85 of the gestalt 2 of operation The point that a chrominance signal SC-2 is outputted from the reverse matrix means 91 since a means to compute and output the digital luminance signal SY2 based on image data SR2, SG2, and SB2 is the reverse matrix means 91 from the luminance-signal calculation means 15, The point arranges the equalization means 93 in the preceding paragraph of the matrix means 11, equalizes a luminance signal SY2, and it was made to output a luminance signal SY3, and by having changed arrangement of the equalization means 93 into the preceding paragraph of the matrix means 11 It is the point that the output of the image detection means 92 is the control signal CY1 which chooses filtering to a luminance signal SY2. Since other configurations are the same as that of the image display device 85 of drawing 12, explanation is omitted.
[0160] Drawing 25 is the block diagram showing the image display device of other configurations in the gestalt 6 of operation of this invention. The image display device 89 of drawing 25 a different point from the image display device 86 of drawing 13 of the gestalt 2 of operation The point arranges the equalization means 93 in the preceding paragraph of the matrix means 11, equalizes a luminance signal SY2 like the case of drawing 24, and it was made to output a luminance signal SY3, By having changed arrangement of the equalization means 93 into the preceding paragraph of the matrix means 11, it is the point that the output of the image detection means 92 is the control signal CY1 which chooses filtering to a luminance signal SY2. Since other configurations are the same as that of the image display device 86 of drawing 13, explanation is omitted.
[0161] Drawing 26 is drawing showing the internal configuration of the image detection means 92 of drawing 24 - drawing 25. The image detection means 92 is constituted by the comparison means 95 corresponding to the luminance signal of a digital signal which consists of a comparator etc., for example, and the threshold storage means 94 which consists of memory etc. and a control signal generation means 96 which consists of a microprocessor etc., for example to generate a control signal CY1 from the comparison result of the comparison means 94. In addition, a control signal CY1 is a control signal

for choosing the filter which carries out data smoothing to a luminance signal SY2.
[0162] Drawing 27 is drawing showing the internal configuration of the smoothing means 93 of drawing 24 - drawing 25. The smoothing means 93 is constituted by the filter (the 1st filter means 98, 2nd filter means 99) which is two pieces from which the property respectively connected to each output of the selection means 97 which is a 1 input 2 output changeover switch etc., and the selection means 97 differs.
[0163] The digital luminance signal SY2 is inputted into the selection means 97 with the smoothing means 93. In that case, the output of the selection means 97 is controlled by the control signal CY1 outputted from the control signal generation means 96 of the image detection means 92 so that either of 2 outputs is chosen. A luminance signal SY2 is inputted into the filter means of the direction chosen by the selection means 97, and the output processed with the filter property is outputted to the display means 8 as image data SY3. In addition, suppose that the filter shape when not graduating can also be chosen as a filter shape in this case. That is, outputting as SY3 grade, without carrying out data smoothing (filtering) to the image data SY2 grade to input can also be chosen.
[0164] Next, actuation of the image display device of the gestalt of this operation is explained. Since the differences of actuation between the image display device of the gestalt 2 of operation and the image display device of the gestalt of this operation are only actuation of the image detection means 14 of the gestalt 2 of operation, and the equalization means 5-7, actuation of the image detection means 92 of the gestalt 6 of operation, and the equalization means 93, and a difference, only actuation of image detection equipment 92 and the equalization means 93 is explained below, and other explanation of operation is omitted.
[0165] A luminance signal SY2 is inputted into one input section of the comparison means 95 in the image detection equipment 92 of drawing 26. The threshold storage means 94 is connected to the input section of another side of the comparison means 95, and the threshold corresponding to a luminance signal SY2 is inputted into it. With the comparison means 95, comparison processing with a luminance signal SY2 and the content of storage of the threshold storage means 94 is carried out, and a comparison result is inputted into the control signal generation means 96. The control signal generation means 96 judges with the value which carried out the value set up beforehand, data processing, etc. from the comparison result of the comparison means 95, and sends out the control signal CY1 for choosing data smoothing (filter) from the control signal generation means 96 to the smoothing means 93.
[0166] When a luminance signal SY2 is smaller than the threshold set up beforehand, it judges with the luminance signal SY2 being the dark space in a display image, and when a luminance signal SY2 is larger than a threshold, the luminance signal SY2 is judged conversely to be a bright section in a display image. And the image detection means 92 detects the bright section of the image which adjoins the dark space of an image like the gestalt 2 of operation from the luminance signal of the dark space of the image judged as mentioned above, and a bright section. Other actuation is the same as actuation of the gestalt 2 of the above-mentioned implementation.
[0167] Thus, the image display device of the gestalt 6 of this operation Since the brightness of the bright section which adjoined without raising the brightness of the dark space of an image can be reduced even if it is the case where it constitutes so that the bright section of the image which adjoins the dark space of an image from the data of the luminance signal in image data in an image detection means may be detected When a dark alphabetic character and a dark line are displayed on a bright background, in order to be able to improve the phenomenon a line looks thinly and to graduate image data in three primary colors, it can be made a easier configuration than the gestalt 2 of the operation which needs three smoothing means.
[0168] In addition, although 1 pixel of the display means 8 explained the case where the cel in three primary colors had been arranged in order of red (R), green (G), and blue (B) from the left, with each above-mentioned operation gestalt, this invention is applicable also to the image display device which does not restrict to this and has the display means of other order of arrangement.

[0169]
[Effect of the Invention] As mentioned above, since the data of this invention of claim 1 and claim 8 can be smoothed only in the bright section which adjoins dark space, even if it displays a dark alphabetic character and a dark line into a bright background, a line does not look thin, the parts of the bright alphabetic character in a dark background or a line are not graduated, but the image display device with which the sharpness of an alphabetic character or a line does not deteriorate can be offered further.
[0170] This invention of claim 2 can smooth data individually and selectively to the data for every color in three primary colors, when the data for every color in three primary colors are obtained from input image data in addition to the effectiveness of claim 1.
[0171] This invention of claim 3 can smooth data individually and selectively to the data for every color in three primary colors based on a luminance signal, when the data and the luminance signal in three primary colors for every color are acquired from input image data in addition to the effectiveness of claim 2.
[0172] Since the data of this invention of claim 4 and claim 9 can be smoothed only in the bright section of the image which adjoins the profile of an image, even if it displays a dark alphabetic character and a dark line into a background brighter than claim 1, a line does not look thin, the parts of the bright alphabetic character in a dark background or a line are not graduated, but the image display device with which the sharpness of an alphabetic character or a line does not deteriorate can be offered further.
[0173] Since the data of this invention of claim 5 and claim 10 can be smoothed only in the bright section of the image which adjoins the dark space below predetermined width of face, even if it displays a dark alphabetic character and a dark line into a background brighter than claim 1, a line does not look thin, the parts of the bright alphabetic character in a dark background or a line are not graduated, but the image display device with which the sharpness of an alphabetic character or a line does not deteriorate can be offered further.
[0174] Since this invention of claim 6 and claim 11 can change the property of a filter of performing data smoothing for every color in three primary colors, it can decrease lowering of the sharpness of an image rather than claim 1.
[0175] Since this invention of claim 7 and claim 12 ends by one piece without needing three smoothing means in addition to the effectiveness of claim 3, in order to graduate image data in three primary colors, it can be made an easy configuration.

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[Translation done.]



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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the image display device of the

operation gestalt 1 of this invention.
[Drawing 2] It is the block diagram showing other examples of a configuration of the image display device of drawing 1 .
[Drawing 3] It is the block diagram showing other examples of a configuration of the image display device of drawing 1 .
[Drawing 4] It is the block diagram showing other examples of a configuration of the image display device of drawing 1 .
[Drawing 5] It is drawing showing the internal configuration of the image detection means 4 of drawing 1 - drawing 4 .
[Drawing 6] It is drawing showing the internal configuration of the smoothing means 5 of drawing 1 - drawing 4 .
[Drawing 7] (a) and (b) are drawings showing the luminance distribution for every cel at the time of displaying the image of dark space and a bright section.
[Drawing 8] (a) and (b) are drawings showing an example of the property of the smoothing filter used in a smoothing means.
[Drawing 9] It is drawing explaining an example of control of the smoothing means by the image detection means.
[Drawing 10] (a) and (b) are drawings showing the result of having used the filter of drawing 8 for each image data before data smoothing of drawing 7 (a) and (b), and having performed data smoothing.
[Drawing 11] It is the flow chart which shows actuation of the image detection means 4 of drawing 1 .
[Drawing 12] It is drawing showing the image display device in the gestalt 2 of operation of this invention.
[Drawing 13] It is the block diagram showing the image display device of other configurations of drawing 12 .
[Drawing 14] It is the block diagram showing the image display device of other configurations of drawing 12 .
[Drawing 15] It is drawing showing the internal configuration of the image detection means 14 of drawing 12 - drawing 14 .
[Drawing 16] It is drawing showing the image detection means in the image display device in the gestalt 3 of operation of this invention.
[Drawing 17] It is the flow chart which shows actuation of the image detection means of drawing 16 .
[Drawing 18] It is drawing showing the image detection means in the image display device in the gestalt 4 of operation of this invention.
[Drawing 19] (a) and (b) are drawings showing the result of having graduated the image data before data smoothing shown in drawing 29 (a) and (b).
[Drawing 20] It is the flow chart which shows actuation of the image detection means of drawing 18 .
[Drawing 21] It is drawing showing an example of the property of the smoothing filter of a different property for every three primary colors used in the smoothing means in the gestalt 5 of operation of this invention.
[Drawing 22] It is drawing showing the result of having graduated each image data before data smoothing of drawing 7 (a) and (b).
[Drawing 23] (a) and (b) are drawings showing the result of having graduated the image data before data smoothing shown in drawing 29 (a) and (b).
[Drawing 24] It is drawing showing the image display device in the gestalt 6 of operation of this invention.
[Drawing 25] It is the block diagram showing the image display device of other configurations in the gestalt 6 of operation of this invention.
[Drawing 26] It is drawing showing the internal configuration of the image detection means 92 of drawing 24 - drawing 25 .
[Drawing 27] It is drawing showing the internal configuration of the smoothing means 93 of drawing 24 - drawing 25 .

[Drawing 28] It is the block diagram showing the configuration of the conventional image display device.
[Drawing 29] (a) and (b) are drawings showing the luminance distribution for every cel.
[Drawing 30] It is drawing showing the property of the smoothing filter used for the conventional profile amendment.
[Drawing 31] (a) and (b) are the luminance distribution of the image which carried out data smoothing of the image shown in drawing 29 using the smoothing filter of drawing 30 .
[Description of Notations]
1 An A/D-conversion means, 2 input terminal, 17 input terminal. An A/D-conversion means, 3 An A/D-conversion means, 4 An image detection means, 5 A smoothing means, 6 A smoothing means, 7 A smoothing means, 8 A display means, 9 A/D-conversion means, 10 An A/D-conversion means, 11 A matrix means, 12 An A/D-conversion means, 13 A Y/C separation means, 14 An image detection means, 15 An input terminal, 16

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[Translation done.]



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CORRECTION OR AMENDMENT

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[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Category partition] The 2nd partition of the 6th category
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[Procedure amendment]
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[Procedure amendment 1]
[Document to be Amended] Description
[Item(s) to be Amended] The name of invention
[Method of Amendment] Modification
[The content of amendment]
[Title of the Invention] An image display device, the image display approach, and the image-processing approach
[Procedure amendment 2]
[Document to be Amended] Description
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[The content of amendment]
[Claim(s)]
[Claim 1]
A smoothing means to perform data smoothing selectively to the image data to input,
An image detection means to generate the control signal which chooses data smoothing performed to the image data of the bright section which adjoins dark space while distinguishing the dark space and the bright section of an image from the image data to input, and to send out to said smoothing means,
A display means to display an image based on the image data outputted from said smoothing means
The image display device characterized by preparation ******.
[Claim 2]
When the data for every color in three primary colors are obtained from said image data to input,
Said smoothing means is established so that data smoothing can be individually performed selectively with said control signal to the data for said every color in three primary colors,
Said image detection means is an image display device according to claim 1 characterized by sending out to a smoothing means to generate a control signal and to correspond according to an individual to the data for said every color in three primary colors.
[Claim 3]
When a luminance signal is acquired from said image data to input with the data for every color in three primary colors,
Said image detection means is an image display device according to claim 2 characterized by generating a control signal and sending it out to a smoothing means to correspond, for said every color in three primary colors based on said luminance signal.
[Claim 4]
While said image detection means distinguishes the dark space and the bright section of an image from input image data, the profile section of said image is detectable,
Claim 1 characterized by generating the control signal which chooses data smoothing performed to the image data of this bright section, and sending out to said smoothing means when the image which adjoins the profile of an image is a bright section thru/or the image display device of three given in any 1 term.
[Claim 5]

While said image detection means distinguishes the dark space and the bright section of an image from input image data, the dark space of said image can detect that it is below predetermined width of face, Claim 1 characterized by generating the control signal which chooses data smoothing performed to the image data of the bright section of the image which adjoins the dark space of this image, and sending out to said smoothing means when the dark space of an image is below predetermined width of face thru/or the image display device of three given in any 1 term.

[Claim 6]

Said smoothing means is the image display device of five claim 2 characterized by changing the property of a filter of performing data smoothing for said every color in three primary colors thru/or given in any 1 term.

[Claim 7]

When a luminance signal is acquired from said image data to input with the data for every color in three primary colors,

Said smoothing means is established so that data smoothing can be selectively performed to said luminance signal with said control signal,

Said image detection means is an image display device according to claim 1 characterized by generating and sending out said control signal over said luminance signal.

[Claim 8]

The step which detects the dark space of an image from the image data to input,

The step to which data smoothing is not made to perform to this image data when the image data used as the dark space of an image is detected,

The step which detects the bright section of an image from the image data to input,

The step which chooses the filter to graduate to this image data when the image data used as the bright section of an image is detected,

The step which repeats each above-mentioned step until image data is completed

The image display approach characterized by ****(ing).

[Claim 9]

The image display approach according to claim 8 further characterized by choosing the filter graduated to this image data at a step when the image data used as the bright section of said image is detected only when this image data adjoins the profile section.

[Claim 10]

The image display approach according to claim 8 further characterized by choosing the filter graduated to this image data at a step when the image data used as the bright section of said image is detected only when this image data adjoins the dark space of predetermined width of face.

[Claim 11]

Claim 8 characterized by choosing the filter with which properties differ for every color in three primary colors at a step when the image data used as the bright section of said image is detected thru/or the image display approach of ten given in any 1 term.

[Claim 12]

Claim 8 characterized by choosing the filter which graduates a luminance signal at a step when the image data used as the bright section of said image is detected thru/or the image display approach of ten given in any 1 term.

[Claim 13]

It is the image-processing approach at the time of displaying a color picture on an image display device,

The step which detects the dark space of an image from the image data to input,

The step which detects the bright section of an image from the image data to input,

It has the step which graduates the image data to input,

At the step which graduates said image data, the image data of the bright section which adjoins the detected dark space is graduated.

The image-processing approach characterized by things.
[Procedure amendment 3]
[Document to be Amended] Description
[Item(s) to be Amended] 0034
[Method of Amendment] Modification
[The content of amendment]
[0034]
This invention of claim 12 is characterized by choosing the filter which graduates a luminance signal in the image display approach of ten claim 8 thru/or given in any 1 term at a step when the image data used as the bright section of said image is detected.
This invention of claim 13 is equipped with the step which detects the dark space of the image data which is the image-processing approach at the time of displaying a color picture, and is inputted into an image display device to an image, the step which detects the bright section of the image data to input to an image, and the step which graduates the image data to input, and is characterized by to graduate the image data of the bright section which adjoins the detected dark space at the step which graduates image data.

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[Translation done.]